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(The Organ of the Mysore Agricultural and Experimental Union)

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IN THIS ISSUE

Utilisation of Silk Worm Pupæ.
Symposium on "Preservation and Processing of Food Grains"
Cattle Fairs in Mysore.

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The Mysore Agricultural Journal

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EDITORIAL

In this issue of our Journal we are publishing a note entitled " The Eleventh Commandment by Dr. Walter C. Lowdermilk ", extracted from the *Journal of the Jamaica Agricultural Society*, pertaining to soil erosion.

The eleventh commandment enunciated by the writer in question is a timely reminder which seeks to urge on us the importance of guarding mother earth from ravages due to forces of nature.

The question of soil erosion is engaging the close attention of agronomists, governments and the farmers themselves in some of the agriculturally advanced countries; more particularly the United States of America where legislation is resorted to to put a stop to the slow but steady onslaught of soil erosion.

Most of our agriculturists worship the land they till, yet not only do they ill-treat her by their careless methods of cultural operations but also allow her to be plundered by forces of Nature. If only they could tend her carefully and bestow a little more care to enrich her fertility and preserve her fine earth by careful husbandry, mother earth will eventually repay them hundredfold, in due course. Terracing, contour ploughing, bunding, gully plugging or strip method of cultivation or even growing of " Kudzu ", and similar, soil preserving cover crops as in U.S.A., is quite unknown in our country.

Ignorance as to the cause and effect of soil erosion cannot be taken as an excuse for allowing this colossal loss of soil fertility to go on indefinitely. Even some educated persons have failed to realise the implications of soil erosion. There are others too who, while seeing what is happening to the lands around them—lands torn by yawning chasms and gullies on the once flat land, declare that the soil erosion is not a great problem in Mysore. We would rather not answer this directly but invite the kind attention of such whenever they travel from place to place or cross the country, to go out with eyes open and mind unbiassed and see for themselves what has happened to mother earth in many places. Lightly covered lands, or lands overgrazed, once flat, have now become ravaged into gullies or deep ravines, footpaths or cart-tracks over open sloping grounds have by force of running water cut into the soil deeper and deeper ruts, which have ultimately denuded the surface of the land. What has happened to the good land in front of Yeswantpur Railway Station is a case in point. All the fine soil is thus

washed away into ponds, tanks and rivers. The tanks get silted up and the water-holding capacity is thus reduced. The river carries away fine soil into the sea which is lost for ever.

In Mysore, in particular, the soil erosion question, though serious enough, has not yet received the attention it should. As a rough estimate, severa lakhs of acres of good land are thus affected and most of these come under the category "assessed or cultivable waste lands". Soil erosion in the State is not confined to the wetter part of the State. Even in the maidan parts of Bangalore, Kolar and Hassan and in other districts erosion is of common occurrence.

In other countries where population pressure has increased and where fresh cultivable lands are scarce, reclamation of land subjected to erosion or marshy lands is undertaken. In Mysore, the population of both people and livestock is steadily increasing.

At present we have less than 1 acre of cultivated land per head of population and less than an acre for cattle grazing. The land still available for cultivation excepting gomals and current fallows is only 2,371,121 acres. Besides, the State has so many irrigation projects under contemplation and when these are taken up a very large area will be covered with water and some land becomes marshy and therefore our land resources will be considerably curtailed in time. However, as population goes on increasing at the present rate of about 13% in every 10 years in about 50 years we need not only more land but also should bring to bear all the scientific knowledge to increase and double the yield of crops. Perhaps at a distant time we may even have to bring back badly eroded land into shape for cultivation. However instead of allowing the present state of soil erosion to continue some thought and action to arrest this process of land impoverishment is very necessary in Mysore.

We commend the eleventh commandment enunciated by Dr. Walter C. Lowdermilk for the strict observance by all those whose living comes out of mother earth and thus preserve to posterity the soil fertility that is our heritage; and treat it as a current account in a stable bank.

Utilisation of Silk Worm Pupæ

By M. J. Narasimhan, B.A.

Director of Agriculture in Mysore

It was during World War I that the idea took shape, of using the large quantity of waste products which are carelessly or with intention thrown away and converting them into food, fodder, manures, and many other necessities of life, which were not largely available. There are innumerable instances of the successful attempts made to turn into account the waste materials and residues collected in factories, breweries, forests, farms, etc., even to the extent of conversion of these materials into human food. We, in Mysore, with many industrial concerns working, and with a large variety of agricultural crops growing, have not devoted any attention to the utilisation of waste materials. The waste materials of the Sugar Factory, such as lees, bagasse ash, etc., of the Iron and Steel Works, of ginning factories, etc., as well as the vast quantity of waste thrown out of harvested agricultural crops, have not been turned to use. It is desirable that we should take up a scientific study of the waste materials we have or at least follow the lead given by similar investigations in other countries and adopt them here.

One such instance of a good waste material neglected, is the large quantity of chrysalids left over in the basins during the reeling of silk. Approximately this will be about 75% to 80% of the weight of the cocoons so that the quantity left over in our filature houses, which handle a quantity of 80 lakhs of lbs. of cocoons, will be 60 lakhs of lbs. of worms. It is natural that, since one's main interest is centred in silk, the waste products are thrown away. But the disposal of these dead worms is a problem. At every filature, basketsful of worms are collected and thrown into a pit every day where they begin to putrify rapidly emitting a fœtid smell, and forming a breeding place for flies. Chrysalids taken fresh out of the basins begin to putrify in 2 to 3 hours' time. In order to preserve what substances of any value they may contain, they should be rapidly dried in a current of hot air. I got some quantity dried in the hot air-box which is used for drying cocoons, with the result that the material thus dried, powdered and stored for over six months has not developed any offensive smell, but only has a definite odour of peptone. Apart from the various uses to which this dried material can be put to, it has to be stated, at the outset, that the inhabitants nearby will be rid of the nauseous smell, at present experienced by them.

Uses.—The composition of the chrysalids, as analysed in Italy, has been found to be: 9·9% Nitrogen, 1·8% Phosphoric Acid, 1% Potash. Analytical data of N as reported in Japan:

Total N	..	8·82%
Protein N	..	7·89%

As Source of Oil.—Out of the 6,000 tons o material, available in Italy, a kind of oil is extracted which is used in making ordinary soaps. The material contains 18% oil (20% in the Mysore material according to our analysis) which is reddish brown in colour, and which can be cleared by treating with sulphuric acid, and then with kaolin or Fuller's earth. The saponification index is 190. The oil has also been used for extraction of fatty acids of glycerine.

As Fertiliser.—With the N value at 9·9%, the material could be used as a fertiliser, to test the value of which experiments are under way.

As Stock Feed.—Owing to the large protein content 65% after it is freed from fat, the meal was found to be good to feed cows and horses in Italy and in Japan, the chrysalid meal was successfully fed to goats, and both in Italy and Japan, it is generally fed to poultry. As Nukada[1] has summarised,

> " Useful disposal of this refuse of Japan's main home industry has been found in utilising it as fertiliser, feed in poultry raising, and in fish culture ".

It was found that when the wet worms are fed to poultry, the eggs had an unpleasant smell, but it was not evident when the dried material was fed. Only in the case of pigs it is known that this feed imparts an unpleasant taste to the pork.

As Media for Bacterial Cultures.—The media for cultures is prepared as follows:—

To 1 litre of tap-water is added 100 grammes of dried pupæ powder, boiled for 1 hour and left in the steam steriliser for 1 hour, and filtered. A yellow liquid is obtained. For bacterial cultures pH is adjusted to 7·2. Minoru-Nukada[1] reported successful cultures, on this media with *Bacillus typhosus, B. paratyphosus, B. dysenteriac* and *Staphyloccus* spp. The cultures were just as good as those obtained on beef bonillon pepton-sodium chloride media. He noticed however that the growth on the silk worm pupæ media with 0·5% NaCl was added to it, was better than the one without the salt. According to Nukada, the yellow extract of silk worm pupæ could be evaporated to the consistency of a paste, which could be kept for one year without losing its properties. In our Laboratory, cultural work on this media, with plant pathogenic bacteria and fungi, are at present under way.

The importance of Nukada's work[1] is that silk worm pupæ obtained at practically no cost, can replace the costly beef and peptone, which are at present considered essential for bacterial cultures of pathogens. According to Nukada, the cost of manufacture of typhoid and cholera vaccines can be reduced by 75%.

It will thus be seen that we are at present throwing away large quantities of a material which has possibilities of being turned to a variety of good uses.

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[1] Minoru-Nukada, "Extract of Silk Worm Pupæ," *Philippine Journal of Science*, LX, 1936, p. 11.

Note on a Better Way to Raise Cardamom Seedlings in the Nursery

By V. S. Ponnurangam, L.Ag.

Agricultural Inspector in-charge of Cardaum Station, Manjarabad

From visits paid to several cardamom estates round about Manjarabad, it is observed that enough attention is not being paid to successfully raising cardamom seedlings for planting in the clearings. The site generally selected by the planters for laying out the nursery is vacant paddy lands. Beds are formed by opening trenches and the trenches are often not deep enough to facilitate thorough drainage, which is absolutely necessary for the seedlings. As for the surface of the beds they are rough and rugged, consisting of small clods; as a result germination, poor as it already is, takes place under hard conditions. In some places the seedlings are transplanted to the second nursery from where they will finally be taken to the clearings, whereas in some places the seedlings are allowed to remain in the germination beds until they are removed to the clearings. On account of faulty lay out of the nursery and lack of attention later on, a large number of seedlings from 30% to 75% is lost at various stages of their development in the nursery itself. First of all on account of rough beds and bad drainage the germination is poor. Out of the seedlings that have come out, some are lost by way of wet rot or damping off, which is again due to bad drainage, as well as over-watering which is generally the case; and out of what still remains, the majority of them perish during the monsoon on account of the rains pouring continuously over the plants. During the rainy season the average daily sunshine period is very low and therefore there is practically no evaporation of excess moisture from the beds. Lack of proper drainage and prevention to excessive soaking of beds during heavy rains lead to heavy damage to cardamom seedlings. The seedlings at first look pale and later the tissues of the tender leaves begin to disintegrate and finally rot, leaving only the main stem which also in some cases rots away. The seedlings that still remain after surviving a monsoon are taken by the planters for being planted in the clearings. These seedlings will not be so very vigorous and healthy; on the other hand they will be pale, undersized and full of spots (see Plate IV). When such are the conditions of the seedlings that are planted in the clearings one can just imagine how they will perform later on. Especially in places of heavy rainfall, *i.e.*, 150 inches and above, the loss of seedlings is shocking, as it goes to as much as 70% (*vide* Table). If proper care is bestowed to nursery management, it is possible to get the maximum number of healthy plants with the minimum quantity of seeds sown, no matter if it involves some extra cost at the beginning. It will be found to be profitable in the long run.

The very first problem that attracted our attention at the Cardamom Experimental Station, Kadamane, was to find out the best way to raise the seedlings. For this a number of experiments were laid out at the Station on nursery practice and it is from the experience gathered from there, the following suggestions are given which may be of interest to the cardamom planters.

Seed Selection.—Seeds are selected from well ripened fruits belonging to vigorous and well-bearing plants preferably of more than 5 years old, which are also free from disease. After pealing, the seeds may be mixed with ash and dried in shade for 3 to 5 days. They are then ready for sowing.

Nursery Site and Bed Formation.—The site selected for the nursery should preferably be in an elevated place to ensure free natural drainage. It is quite imperative that even at the height of the monsoon the site is not subjected to water-logged conditions. The entire site may be given a good digging to a depth of about 1 foot. Beds are formed by opening trenches 1′ wide and 3′ apart. The clods are then crushed and the surfaces of the beds are brought to a fine tilth and level. If the soil is found to be rather stiff the same may be made more porous by adding some sand. The top 3″ of the soil may be mixed with well-rotted powdered cattle manure; about 3 baskets-full will do for a bed of 12′×3′.

Seed Rate and Sowing.—The seeds may be sown evenly and almost touching one another. About ½ lb. of seed can occupy a bed of 12′ × 3′. After completing the sowing the top of the bed may be sprinkled with a mixture of jungle soil and sand of equal proportion. About 3 baskets of the mixture will do for a bed of 12′×3′. The surface may then be tapped with a flat plank gently but firmly throughout and the entire bed may be covered with fresh wild ferns or with straw.

Watering.—This should be done with watering can fitted with a fine rose. First watering may be done profusely so that the entire depth of the bed becomes wet. Subsequent watering may be done as the surface of the beds just show signs of drying. In most places over-watering has been the cause of so much of trouble. Generally no shade is necessary over these beds and they can be left fully exposed to sun; but overhead shade will be useful to ward off heavy dew or rain.

Under the above conditions germination will start between the 25th and the 30th day from the date of sowing. This may be observed by gently lifting the fern covering. When the germination is found scattered throughout the major portion of the beds the ferns or straw mulch can be removed and the entire surface may be mulched with finely chopped or crumpled dry leaves. This mulching may be replenished as often as is found necessary. Overhead shade be provided now.

Transplanting in the Second Nursery.—This is taken up when the plants in the germination beds have developed two pairs of leaves, which will be about three months from the date of sowing. For laying out the nursery

PLATE I. Cardamom seedlings raised under thatch—a close view

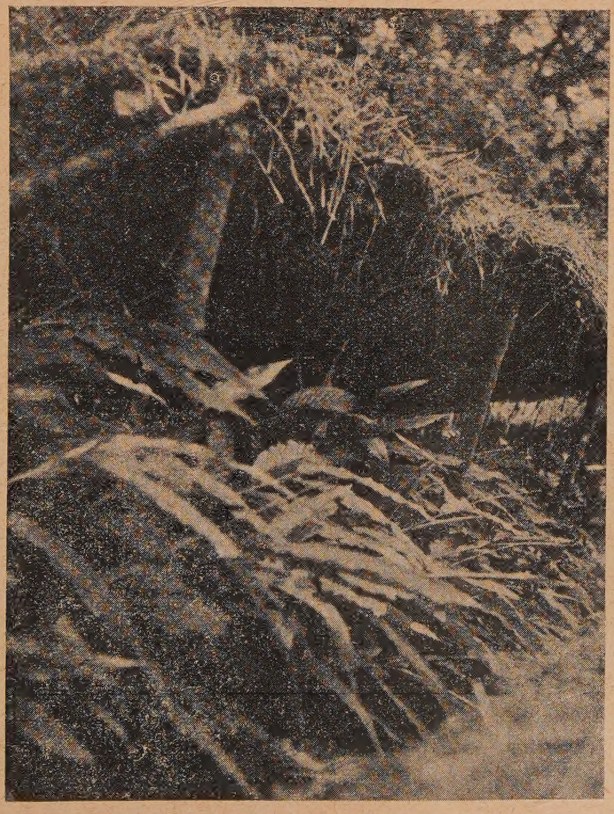


PLATE II. Close view of a bed of seedlings under thatch

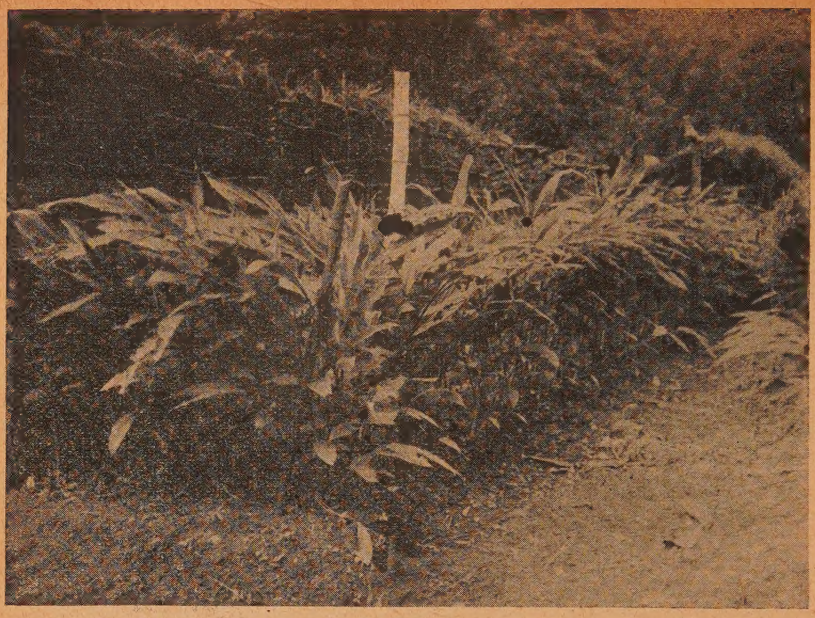
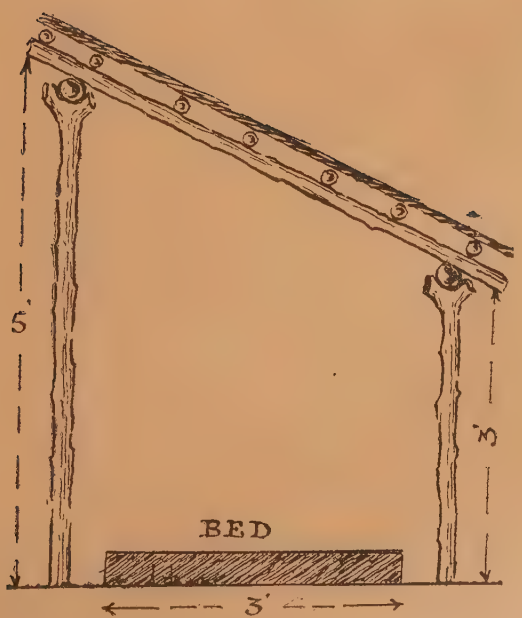


PLATE III. Cardamom seedlings raised under thatch—side view

PLATE IV. Plants raised without thatch

PLATE V. General view of nursery with thatch



Sketch showing the measurement of bed and thatch

for this purpose also the method described in para 4 may be followed; but the digging may be deeper and the drains full 18″ wide and the height of the beds may be adjusted to about 6″. As for the length, it may be kept to any convenient extent. The dose of cattle manure may be increased to about 4 to 6 baskets. Pendals may be erected over the beds to permit only broken thin shade.

After profusely watering the germination beds the seedlings may be removed with care seeing that least damage is caused to the roots. They are then planted in this nursery 6″ apart from plant to plant. While planting care should be taken that the roots of the seedlings are spread well and buried and the soil pressed firmly all round. It is better if the direction of the growth of the seedlings are so adjusted while planting that they point towards west. Here also great care is to be paid to prevent over-watering.

Care of Seedlings during Monsoon.—As already stated, it is during this period, the seedlings undergo very trying conditions in their life. A large number of them perish on account of the rains falling continuously over them for three to four months. To find out how best it is possible to protect the seedlings during the rains an experiment was laid out at Kadamane Station on the following lines:—

Four beds of 12′ × 3′ were laid out. Of these two were provided with thorough drainage system by filling the bottom 1′ of the bed with stones and providing deep trench all round. The other two beds were laid out in the ordinary way. Out of the four beds one with drainage and one without drainage were provided with overhead thatches to prevent rains falling over seedlings. The other two (one with drainage and one without it) were left exposed to rains. All the four beds were planted with Mysore cardamom seedlings; the soil composition of the beds, the age of the seedlings and the date of planting being constant throughout, after the close of the monsoon, the following observations were made:—

Sl. No.	Description of beds	No. of seedlings planted before monsoon	No. of seedlings counted after close of monsoon		% Age of loss		Height of seedlings	Condition
			I Year	II Year	I Yr.	II Yr.		
1	With drainage and thatch	168	154	139	8	17	2′ to 3′	Vigorous, green and having up to 7 tillers
2	With drainage but without thatch	168	80	56	52	67	8″ to 1½′	Pale, spotted leaves with few or no tillers
3	Without drainage but with thatch	168	146	161	13	4	2′ to 3′	As with treatment 1
4	Without drainage or thatch	168	93	49	45	70	8″ to 1½′	As with treatment 2

From the above table it is found that irrespective of providing with drainage or not, the plants in the beds without thatch suffered loss to an extent

of 45% to 70%, whereas the loss of plants in the beds protected with thatch suffered so little as 4% to 17%. The plants under thatch were further healthy with many tillerings as against those without thatch which were bad, stunted and diseased. Plates I and II show the close view of one year-old plants (one year old from the date of sowing) of the II Nursery of the Station raised under thatch. Plate III shows a side view of the same and Plate IV illustrates the deplorable condition of a bed of plants raised without thatch. Plate V gives an idea of the general view of the nursery with thatches. All the photos are of plants raised at the Station at Kadamane, where the rainfall is very high, varying between 260 and 312 inches per year. The growth and vigour of the plants shown in Plates I to III give an idea as to the important part played by the overhead thatches by way of protecting the plants during the monsoon rains. The plants are from seeds sown during November 1943, transplanted in the II Nursery during March 1944 and the photos were exposed during November 1944.

The thatch may be easily put up. Jungle grass, date or cocoanut palm leaves or any other suitable stuff available in the area may be used for thatching the top. It is necessary that it should be water-proof.

Whether it be plant or animal, there is nothing like giving a good start at the very beginning of its life. As healthy and vigorous seedlings are the first essentials to open a plantation it is indeed a wise policy to pay special attention to raising seedlings in the nursery and the extra expenses incurred therefor is compensated in due course. In Manjarabad due to lack of proper care and management of nursery, the death of cardamom seedlings is very great; and this colossal wastage of planting material can be totally avoided by providing the overhead thatch as suggested.

A Note on the Control of Sugarcane Borer Pests in the Irwin Canal Area

Contributed by the Entomological Section

1. Introduction

The extensive cultivation of sugarcane under the Irwin Canal was begun in 1931 to meet the requirements of the Sugar Factory which was erected at Mandya in that year. The Entomological Section took up the study of the incidence and control of the borer pests of sugarcane soon after, and tested the efficacy of different mechanical methods of control then known such as steeping setts in water, collection of moths in trash-heaps, systematic cutting of dead hearts, etc. These methods proved to be unsuitable and rather ineffective in this tract owing partly to the extensive blocks under cultivation and partly to the occurrence of young cane all the year round.

Preliminary trials with *Trichogramma* parasites bred in the Central Laboratory at Bangalore were then conducted for one or two seasons on the Irwin Canal Farm, and the performance of the parasites was carefully studied. These observations having shown that the laboratory-bred egg parasites when released at proper intervals in the young crop could effectively control the stem-borer pest it was considered desirable to extend the scope of this work.

The 1934 ' B ' season proved to be a severe one with a very high incidence of the pest, about 20% of the entire crop,—on a conservative estimate being lost on this account. Methods of mechanical control proved unavailing and cumbersome in this bad period and it was therefore decided to establish a laboratory in Mandya, specially for the mass multiplication of *Trichogramma*,—the first of its kind in India,—for the ' biological control ' of the pest in the area, and generally for the intensive study of the pest with a view to devise other effective methods of control. This laboratory was started early in 1935, and began the production of parasites from the second season of that year.

2. The Borers

The major sugarcane pests in the tract are (1) *Stem-borers*: (*a*) *Argyria sticticraspis* Hmp. and (*b*) *Argyria venosata* W., which primarily attack only seedling cane up to 3 or 4 months of age. The nature of damage by this pest is the tunnelling in the tender stem in the region of the growing point which soon shows drying in the manner of a 'dead heart '.

(2) *Top Shoot-Borers.—Scirpophaga nivella* W. and *S. monostigma* Z., which normally attack the cane only after it is at least 8 weeks old; cane is susceptible to their attack as long as growth continues. The young caterpillars bore their way downwards through the crown into the growing point thereby destroying it and arresting further growth of the cane.

Usually the incidence of the stem-borer is heaviest in summer months and therefore the 'A' season crop is more susceptible to attack than the 'B' season planting. Data collected from one-gunta experimental plots on two farms in 1938 and 1939 show that attack was as high as 82·6% in April planting and only 1·6% in October planting. Unlike *Diatræa saccharalis* (the borer pest common to other countries) for example, these borers do not attack the crop, after cane-formation has begun, *i.e.*, after 3 or 4 months of age though growing cane may harbour a small number of larvæ mainly in the nodal region. The effect of serious attack is to kill a varying proportion of sprouts all over the field leaving gaps, thereby lowering the tonnage of cane harvested from the plot. Initial infestation may occur from setts, but moths emerging in nearby fields are also attracted to a germinating field for oviposition.

While no marked seasonal variations are noticeable regarding top-shoot borer attack, the second of 'B' season appears to be more favourable for it than the summer. Thus from data collected from 20 plots selected at random, every month, for one year from August 1939 to July 40, it was seen that the highest percentage of attack was 9·2 in October 39, and the lowest 3·6 in May 40. Cane is susceptible to this pest throughout the growth period and the result of attack is the occurrence of short and stunted canes, often developing bunchy side-shoots at the top.

The relative susceptibility of different varieties has been studied; H.M. 320 appears to be the most suceptible and P.O.J. 2878 the least. Of the other varieties used in bulk planting H.M. 607, Co. 419, H.M. 661 and H.M. 647 may be placed in between the above two varieties, in the approximate order of their susceptibility. Naturally the range of variation in each variety is considerable, depending on season, locality, nature of soil and method of cultivation.

Regarding the nature of soil, it may be generally stated that borer incidence is heavier in bad soils than in good soils. In sandy and stony soils, for example, borer incidence is markedly higher than in uniform deep-grey or red soils.

3. Methods of Control

A. Stem-Borer

The following control measures have been found to be very effective against this pest:—

(i) Use of borer-free setts by steeping them for a day or two in water before planting. Since preliminary infestation can occur through setts, it is advantageous to soak setts for a day or two in standing water to kill borers lodging at the buds, before planting. Incidentally, this also promotes quick germination, and the ryots therefore favour this method.

(ii) *Light Earthing-up.*—This cultural method of control is being demonstrated extensively in the royts' fields since 1936 by a special staff of six fieldmen with the result that the ryots have realised the twofold advantage

gained from it and are practising it in their cultivation routine. It consists in protecting the stems of sprouts 4 to 6 weeks after planting with a conical envelope of soil loosened from the ridge between the furrows, either by manual labour or by passing a light plough like the Eureka or Meston. This protective cover of loose earth prevents moths from having access to the stem for egg-laying and in addition, smothers a large proportion of young caterpillars which may have worked their way into open leaf-sheaths at the base of the stem. Thus this simple process helps to keep down infestation to an appreciable extent and besides has the great 'cultural' advantage of giving a much-needed mulch to the soil and also helping to reduce weeds.

During the period of six years from 1937 to 1942 a total area of 22,882 acres of young crop were got protected by light earthing up under departmental supervision. The harvest figures from representative plots have been gathered and submitted for statistical analysis. The statistician has reported that treatment has been effective in improving the yield, irrespective of the period of planting, the average excess yield per acre for the treated over the control area in 1938 being 6·2 tons.

(iii) *Biological Control.*—This method consists, as already mentioned, in the mass multiplication of the natural egg-parasite of the stem-borer moth, *Trichogramma minutum* R. in the Parasite Laboratory at Mandya, and releasing 6 to 8 weekly batches of these parasites in the young crop from about the 4th week after planting onwards. The laboratory host for this parasite employed at Mandya is the *Rice* or *Flour moth* (*Corcyra cephalonica* St.) the eggs of which are 'mounted' on egg-cards and got 'stung' by the parasites in the laboratory. Strips of these parasite cards containing approximately known numbers of parasites about to emerge, are taken into the field where the parasites just beginning to emerge are allowed to escape into the crop. Afterwards the strips containing unemerged eggs are stuck on to the crop here and there. The released parasites naturally seek out egg-masses of the borer moths in the field and parasitise them, thereby rendering them innocuous to the crop. Actually, this is the easiest method of control, as it involves but little effort in the field and has been greatly routinised during these nine years.

The approximate number of parasites per acre now being released varies from 18,000 to 24,000 spread over 6 to 8 weeks, or in terms of cards 6 to 8 cards (one card, a week) since one card is estimated to contain about 3,000 effective parasites. During a period of seven years from 1936 to 1942 a total planting of about 6,840 acres, mostly on farms belonging to the Mysore Sugar Company has been protected by this method, about 7½ crores of parasites having been released in the fields during this period. This acreage also includes 210 acres outside the State, in Cuttack and Banki, Muzzafarnagar, Meerut, Sugauli in Bihar, Balapur and the Punjab—to which places parasites were sent at the request of the authorities concerned. The harvest data from treated plots were submitted to the Statistician for analysis, who

reported an excess yield per acre for the treated area over the control irrespective of the season of planting of 2·8 tons for 1935 to 37 and 3·016 for 1938.

B. Top-Shoot Borer

The control measures adopted against this pest are the systematic removal of moths and their egg-masses from the fields up to an age of about four months beyond which it will not be possible to penetrate into the field. Village children are encouraged to bring in collections of moths and egg-masses secured in their own fields for which they are paid at the rate of 1 anna per 100 moths or egg-masses. The ryots have realised the usefulness of this method of control and therefore destroy large numbers of *Scirpophaga* moths and egg-masses in their own fields.

Scirpophaga egg-masses collected through the agency of village children are not simply destroyed but stored in the laboratory, in tin receptacles having holes cut on the lid over which bottles are kept inverted, for the egg parasites *Telenomus* (*Phanurus*) *beneficiens* Z. and *Tetrastichus* Sp. that emerge from the egg-masses to collect therein. They are then taken into the fields and released to do their beneficial work.

From 1937 when this scheme of subsidised control was started to 1942, about 9 lakhs of moths and 56 lakhs of egg-masses were collected from an area of 8,400 acres at a total cost of Rs. 4,700. This number of moths and egg-masses represents only a fraction of the total numbers actually destroyed, as it does not take into account the populations accounted for by ryots in their fields.

In addition to the above 'mechanical' method of control, ryots are advised to destroy infested tops when cutting cane for setts or for the factory.

4. Conclusion

Of the different methods of control, briefly described above that are recommended against the borer pests in the Irwin Canal tract, except the multiplication (or conservation in the case of the top-shoot borer egg-parasites) and release of egg-parasites the other methods are quite simple and within the means of ryots to carry out. Besides steeping setts in water and light earthing up have other advantages on the 'cultural' side which the ryots have not been slow to perceive and take advantage of. The destruction of *Scirpophaga* moths and egg-masses does not entail extra cost or labour and is a method appealing to the juvenile mind particularly. Rejection of infested tops is not so difficult as it may seem, since normally the top bit prone to infestation, is not suitable for planting and ryots would reject it any way. But the difficulty is in seeing to it that all infested tops are gathered together and destroyed.

During these nine years that the Parasite Laboratory has been in existence at Mandya, the sugarcane cultivators of the Irwin Canal tract have been made to realise the importance of the pests of sugarcane and of the easy methods of keeping them under control that are within their means to carry out.

Symposium on "Preservation and Processing of Food Grains"

Under the auspices of the Society of Biological Chemists, India (Bangalore Branch), a symposium on "Preservation and Processing of Food Grains" was held in the Central College, Bangalore, on Sunday, the 30th September 1945. Mr. M. A. Srinivasan, Minister for Agriculture in Mysore, presided. Thanking the Society for the honour done to him Mr. Srinivasan said:—

"The time has at last gone by when scientists and research workers were looked upon as a race of bespectacled, impractical and incurable fadists who inhabited an obscure underworld of burettes and Bunsen burners, and microscopes and tubes, and dallied with fumes and formulæ. The spread of higher education did something to dispel such notions and correct such an attitude. The onward march of scientific research and the appreciation by the common people of the value of the products and inventions that the scientist placed within their reach did more towards this end. But if gunpowder and T.N.T. did not succeed in blasting out the old attitudes and notions, the atomic bomb—12,000 times more powerful than the most powerful T.N.T.—has certainly blown to bits the last vestiges of any such attitude and taught men to respect, almost to fear, the scientist and research worker. The recent scientific discoveries have split and shattered not only the atom but all current concepts of distance and of time, of power and politics, of security and strategy, of health and wealth and disease, and indeed of life and the universe itself. When everyday what was invisible is being made visible, and the impossible rendered possible, may not one dare to hope that the mortal may yet be immortal? Science has led us to the brink of infinite promise or of the most fearful responsibility; and I cannot help feeling that scientists should sometimes be now thinking that their lay friends and employers behave as children playing with fire or as rowdies throwing soda water bottles at each other."

Speaking of Biological Chemistry, Mr. Sreenivasan proceeded: "I claim no knowledge of the subject, but can think of none more fascinating or more widespread in its application for good or for evil. I have read with great interest—though, I confess, not with equal understanding—some of the papers and proceedings of your Society which includes in its membership not only hundreds of distinguished scientific workers in India but also reputed men of science in all parts of the globe. Your *Annual Review* for 1943 alone has dealt with an array of subjects which are as interesting as they are bewildering—ranging from soils and vitamins, to nutrition and industrial mycology, and touching upon matters like the availability of calcium in lady's fingers, the possibility of weaning kids at birth, the composition of wind-borne dust, and the blood-groups of Muslims.

I see you have had a symposium on the very topical and vital subject of Rice. I have no doubt you have considered the process patented in U.S.A. and U.K., of converting paddy into rice without loss of any of the vitamins and minerals in the rice coating. The process struck me as an elegant and highly developed method of 'parboiling' which has been well-known in this country, and one that helped to make the all-important cereal—rice—not only more nutritious but less susceptible to insect damage. It occurs to me that you might well have a most interesting symposium on the effect on the character and behaviour of men and communities and nations, of what they eat or drink. I am reminded of a passage in Aldous Huxley's *Jesting Pilate*, where that author-philosopher who comes of a distinguished family of scientists expressed bewilderment at what appeared to be the strange docility of a ferocious-looking Indian bull in the streets of Bombay and finally found the clue in the diet of the animal. He said: 'On a diet of waste paper, it is difficult for any bull to be other than a follower of non-violence!'

"The subject of this morning's symposium is one which has been of the utmost immediate interest to me, as it has indeed been to everyone of our countrymen. The magnitude of the loss of valuable food that occurs annually in our country by the ravages of pests, from insects to bandicoots, and from lack of proper information and ideas about storage and preservation, is colossal; it is also tragic, when one realises how sorely additional food is needed by millions of brothers and sisters. Dr. Coyne has stated:

> 'I have no hesitation in saying that rodent damage alone probably accounts for a million tons of all foodgrains, with similar amounts lost from insect and moisture damage. A figure of three million tons may seem astonishing, but that is the order of magnitude of the annual losses in India with which we are concerned to-day. The Imperial Agricultural Research Institute has come to a similar conclusion quite independently, taking the losses at 5% of the foodgrains produced, and arriving at 3·3 million tons.'

Three million tons are three times the average annual pre-war import of foodgrains to India, and represent a loss of over 50 crores of rupees in value. Can it be gainsaid that the man who can save or rescue one grain of cereal out of every two that are now lost is as great, if not a greater and more immediate, benefactor to the country as the one who grows two blades of grass where one grew before?"

Fortification of Food Grains*

By Dr. K. V. Giri, D.Sc., A.I.I.Sc., F.A.Sc.
Indian Institute of Science, Bangalore

Although there has been rapid development of knowledge in foods and its practical application to human nutrition we are still faced with the fact that a large percentage of the population in India is subsisting on diets which are deficient in essential nutrients. This deplorable condition is responsible for the prevalence of various types of deficiency diseases in India. This condition can, however, be improved considerably by increasing the availability of these essential nutrients. It is, therefore, necessary to develop practical means to bring these food essentials within the reach of a large proportion of our population. One of the important steps towards this end is to supply the general public and particularly the poorer class of people with foods containing enough vitamins and minerals for optimal well-being. The supply of vitamin concentrates to children and adults has been suggested and in certain countries this is being put into practice. There are no doubt difficulties of persuading people to eat such concentrates. It is, therefore, necessary that the essential minerals, vitamins and other food factors should be present in the basic foods which are widely consumed in sufficient quantities.

Cereals which constitute about 80 per cent. of the total calorie intake of our food are the most important energy foods and special attention should, therefore, be focussed on these articles of food. It is common knowledge that whole rice and whole wheat are richer in vitamins and minerals than the milled cereals, and the substitution of whole rice or underpolished rice and whole wheat flour for the polished rice and white flour respectively, would appear to be a simple and rational means of increasing the consumption of vitamins. During the last few years in almost every country in the world efforts have been made to encourage the consumption of whole wheat, raw and underpolished rice. In Great Britain the consumption of wheat known as " National wheat meal " flour containing part of the bran is being encouraged. This flour represents about 85 per cent. of the wheat and contains about 3–4 micrograms of vitamin B_1 per gram and good amounts of other B vitamins. The Madras Government also issued directions to millers to underpolish rice. This Order is known as Madras Rice Mills Licensing Order (No. 1), 1943. Divergent expressions of opinion on the advisability of adopting such measures to improve the national dietary have appeared in the press. It is not appropriate here to discuss the advantages and disadvantages of these methods of providing more food

* Paper contributed to the symposium on " Preservation and Processing of Food Grains," held under the auspices of the Society of Biological Chemists, India (Bangalore Branch), on 30th September 1945.

essentials to the population. It may be stated, however, that the whole wheat flour was not acceptable to British public as according to statements reported, the output of National wheat meal bread was only about 7½ per cent. of all bread consumed. Therefore, the attempts made by the Ministry of Food in sponsoring the consumption of 85 per cent. extraction flour failed to persuade the public to change from white bread to National wheat meal. A somewhat similar situation has arisen in India with respect to rice. The majority of our population prefer polished rice. We cannot ignore the fact that palatability is a factor of great dietetic importance, and it is, therefore, desirable that as far as possible attempts should be made to supply the public with products which they like.

The other alternative to the adoption of wheatmeal flour and raw rice is the fortification of cereal grains and their products with adequate quantities of synthetically prepared vitamins and minerals which are now easily available at comparatively low prices. Since cereals and cereal products occupy a prominent place in the daily diet of both adults and children, and in view of the fact that cereals, particularly rice and wheat, are generally processed by methods which remove a large part of the essential nutrients from the grain before consumption, their enrichment with certain of the dietary essentials appears to be of considerable importance. Further, in view of the established relationship between carbohydrates and vitamin B_1, and cereals being important source of supply of body's carbohydrate requirement, it is appropriate that cereals should be selected for " fortification " or " restoration "

What is Fortification ?

The term " fortification " means the addition of vitamins or other dietary essentials to foodstuffs in order to increase the total amount of these constituents more than that usually contained in natural (unprocessed) foods. Another term which is also commonly used in connection with the addition of specific nutrients to foodstuffs, namely " Restoration " refers to the process in which the vitamins and minerals are added to foodstuffs in such quantities as are necessary to restore the levels of these constituents originally present in the foodstuff. The addition of vitamin A and D to margarine and the incorporation of vitamin B_1 in wheat flour, may be considered as true fortification the object of the addition being to bring the vitamin potency of the margarine nearer to that of the natural food, butter for which it is a substitute and to replace the vitamin B_1 which has been lost during the milling of wheat.

Fortification of Cereal Flours with Vitamins

All nutritionists agree that the vitamins in which our diets are most likely to be deficient and for which, therefore, our need is most pressing is vitamin B_1. This is only what would be expected from a consideration of the effects of cooking and processing of food grains, which remove considerable amount of this vitamin. It is, therefore, necessary to explore the various

ways of fortifying the vitamin in cereal products. Let us now survey the position with regard to this aspect of the problem in other countries, before we take up the question of its introduction in our country.

The practice of adding to staple foods such as wheat flour, vitamins and minerals in which the diet is considered to be deficient has been widely recognised in Britain and America. It was Cowgill (1939) who first recommended the addition of vitamin B_1 to white flour and later in 1940 the British Food Ministry, on the recommendation of the scientific advisers announced that all white flour used in Great Britain would be enriched with vitamin B_1. Since then white flour is being fortified with vitamin B_1 and calcium.

In America a similar procedure has been recommended for restoring important nutritional essentials which have been lost in processing important foods. The Council on Foods of the American Medical Association (1940) suggested the restorative addition of vitamin B_1 to cereal products to bring them up to the level of oat meal, the cereal having the highest vitamin B_1 content (300 I.U. per 100 gm. of dry material). This applies to other essentials such as riboflavin. The order which came into force in America in 1942 requires that each pound of enriched flour shall contain between 1·66 and 2·5 milligrams vitamin B_1, between 1·2 and 1·8 milligrams riboflavin, between 6 and 9 milligrams nicotinic acid amide and between 6 and 24 milligrams iron. According to the standards established for nutritionally improved flours called " enriched flours " one gram of enriched flour should contain a minimum of 4·4 micrograms of vitamin B_1 and 33 micrograms of nicotinic acid. After a few months of introduction of the enriched flour, it is stated that 30 per cent. of the bread produced in American bakeries were made from enriched flour.

Now coming to the position in India, it is needless to emphasise the need for enhancing the nutritive qualities of our cereal foods. Rice comes uppermost in the minds of everyone interested in such problems. How best can we improve the diet by fortification ? It is a difficult task to evolve suitable methods of fortification of rice with vitamins and minerals particularly calcium which is notably deficient in rice, as the rice is consumed in the form of cooked grains. In the case of other cereals such as ragi, however, which are consumed as flour, the method of fortification with vitamins is just similar to the one adopted for wheat. About 1–2 milligrams of vitamin B_1 per pound of ragi flour would be more than necessary for optimum requirements of the vitamin. For one bag containing 280 pounds of ragi flour the amount of vitamin B_1 necessary to fortify would be about 0·2–0·5 grams which would cost less than 10 annas.

Technique of Fortification of Vitamins in Flour

The addition of such minute amounts of vitamin B_1, as 0·2 gram per sack of 280 pounds is not an easy task. It is very difficult to distribute evenly such small proportions of vitamin B_1 throughout the flour. This can only be

done by adding to the flour stream, while milling, a preparation containing the vitamin, so that it can be uniformly distributed throughout the flour. Such preparations can be obtained by adding an aqueous solution of vitamin B_1 to a thin suspension of flour in water in suitable proportions and then spray drying the mixture. It is stated that in America automatic mixers capable of adding powders to the flour stream continuously at a rate of one ounce per sack have been in use in the milling industry for many years.

Fortification with Calcium

The addition of calcium in the form of calcium carbonate, as a means of counteracting the adverse nutritional effect of the high phosphorus and particularly the high phytin content of wheat on mineral metabolism has been the subject of discussion in Britain. It is shown that in Great Britain the calcium content of the diet of the poorer classes is generally below the minimum accepted by nutrition experts as necessary for proper growth of bones and teeth in growing children and for the maintenance of bones in adults. White bread contains less calcium and phosphorus than whole meal bread and bread made from flour of 85 per cent. extraction. A large proportion of the phosphorus contained in cereals such as wheat and rice exists in the form of phytin which is not easily available and in addition it interferes with the availability of the calcium present in foodstuffs. Recent researches on human subjects carried out by the Medical Research Council, have shown that more calcium salts should be added to the diet in order to maintain enough supply of calcium. It has been recommended by the Accessory Food Factors Committee (1941) that 85 milligrams of calcium per 100 grams of white flour (7 oz. of calcium carbonate as creta præparata B.P., per 250 lb. sack of white flour) and 130 milligrams of calcium per 100 grams flour of 85 per cent. extraction (14 oz. of calcium carbonate per sack) should be added. The addition of larger quantity recommended for the whole meal flour is to counteract the adverse effect of excess amount of phytin contained in flour of 85 per cent. extraction.

With regard to rice, it is well known that it is the poorest source of calcium than all the cereal grains. Furthermore, the phytin content of unpolished rice is considerably higher than the polished grain (Giri, 1938). The consumption of unpolished cereal must, therefore, be followed by larger consumption of calcium. It is, therefore, necessary to incorporate calcium in some form in our cereal foods, particularly when the rice is consumed as unpolished grain.

Fortification of Food Grains

Treatment of food grains with a view to enhance its nutritive qualities has attracted the attention of various workers in recent years. It is well known that the process widely adopted in India, known as "parboiling" of rice brings about certain changes in the distribution of vitamin B_1 in rice such

that the cereal retains larger part of the vitamin content even after polishing the cereal, when compared to unprocessed cereal. Recently various attempts have been made in U.S.A. and other countries to improve this process of "parboiling" and a process has been developed in America, by which the rice retains about 80 per cent. of the vitamin and minerals in the milled rice. Rice treated by this new process is known as "converted rice". It was first produced by G. Howell and E. Huzenlaub, and the process is known as Huzenlaub process.

According to this process, the unmilled rice is cleaned and placed in vacuum tanks and the air is sucked out of the grain. Hot water at high pressure is forced into the empty spaces formed in the grain. As a result of this operation the vitamins contained in the grain being water-soluble are pushed into the centre of the grain. Steam is then let in to fix the vitamins. The rice is then dried and milled to remove the husk and skins, leaving tough, cream coloured kernels. It is stated that the "converted rice" will keep without deterioration for years in all kinds of weather and it is immune to weevil attack. The rice is stated to possess quite pleasing appearance and good cooking quality. The vitamin B_1 content of converted rice is stated to be twice to three times that of polished rice. It is also stated that by the application of this process Huzenlaub has produced a full-vitamin wheat. Thus the process can be applied to all cereal grains. Another feature of this process is that vitamins and minerals not present in natural rice, wheat or any other grain can be injected into them.

Although, by the application of the above process good quality rice can be obtained, it is an open question whether the process is economical for large-scale production. It is an arduous task to induce the public to consume "converted rice" which is costlier than the ordinary rice. An alternative to the supply of such processed cereals would be the treatment of other nutritionally rich materials, such as groundnut, which are easily available and at the same time are quite cheap. Methods to enhance the digestibility and to incorporate more vitamins in the groundnut can be developed and such enriched materials may be used in small quantities as adjuncts to our basic foods, thereby the intake of vitamins and minerals by all individuals, rich and poor, can be considerably enhanced.

From this short survey of the recent developments in the fortification of food grains and their products, it can be seen that this method of providing the population with essential nutrients is to a certain extent practicable. The value of fortified and enriched food grains and flour in a national nutrition programme will depend considerably on the facilities for their production and suitable education of the public regarding their nutritive value. It is desirable that some form of fortification should be adopted on a national basis in India, particularly in regions where rice predominates in the dietary of the population, and a determined effort should be made to popularise such fortified products in India, and the consumption of such

food materials should be urged by responsible authorities. There is great scope for research on the processing of food grains available in our country with a view to enhance their nutritive qualities by fortification and enrichment with vitamins and minerals. The recent developments in other countries on the fortification of cereal grains emphasise the necessity for scientists and administrators to evolve suitable methods of fortification and suitable system of distribution of such articles of food which will enable full and proper use to be made of scientific advances in processing of foodstuffs.

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Cattle Fairs in Mysore

By K. H. Srinivasan, M.A., B.Sc. (Edn.)
Deputy Director of Agriculture

Mysore is an outstanding cattle-rearing country in South India. It has acquired a fame for its hardy working animals for which there has all along been a demand in the neighbouring territories. It is natural under these circumstances that cattle rearing should have been looked upon as a good subsidiary industry for the raiyat and a system of cattle trade developed in the country. It is on this background that the idea of cattle fairs or *jatras* have taken root and over 120 such fairs are held yearly at present all over the country.

While on the subject it is appropriate to consider the wealth contributed by the cattle population to the State. The cattle population of Mysore according to the Census of 1940 was 49,16,892 including buffaloes representing a capital value of rupees fifteen crores at a modest average figure of Rs. 30 per head. According to one authority, the annual production per animal in British India of milk, labour, manure and other products is estimated at about Rs. 40 per animal. The annual income from all cattle of Mysore at even 50 per cent. of the above calculated figure comes nearly 10 crores of rupees; while the gross out-turn from arable farming is estimated at about 16 crores of rupees. The turnover from the cattle that are exported out of Mysore State may be estimated between 50 lakhs to one crore of rupees. These facts reveal the importance of cattle rearing in Mysore and the rôle the cattle fairs play in fostering cattle trade in the country.

The fairs commence to be held as early as October and go on upto the month of May of the following year, the important ones being mostly over by January. Raiyats have not much of field operations during this period. They attend to bringing up their cattle in condition on the plentiful fodder and water available in the season and try to sell them to an advantage at the fairs. They are not only periodical cattle markets but festive occasions that afford the raiyats relaxation and opportunity to meet friends and relations.

Cattle fairs in Mysore are organised by various institutions—District Boards, Muzrai Institutions, *i.e.*, Temple Trusts, Municipalities and in some instances by other private organisations. Some of the fairs held by Muzarai Institutions are by far the biggest and the oldest, *e.g.*, Subramanyam and Chunchankatte. Some fairs that begin in a small way grow up in course of time. The Hassan fair that began in a humble way 35 years ago ranks as one of the most important in the State at present. Some small fairs may just be halting places for the cattle *en route* to a major fair. So there are chances of new fairs springing up wherever conditions are favourable.

The following figures pertaining to the year 1940–41 indicate the number of fairs, total number of cattle brought to them, and kinds of institutions

holding the fairs in each district; certain fairs are not held when the prevalence of cattle diseases is foreseen.

TABLE I

No. of *jatras* held	Not held	Total number of cattle	By Municipality	Muzrai	District Board	Private
1. Kolar .. 30	4	3,53,110	..	19	8	3
2. Tumkur .. 23	1	1,21,620	1	11	2	9
3. Bangalore .. 22	..	2,11,944	2	8	11	1
4. Mysore .. 11	..	1,12,750	5	3	..	3
5. Hassan .. 12	..	88,100	4	5	2	1
6. Chitaldrug .. 8	..	43,920	2	3	2	1
7. Shimoga .. 5	..	61,500	..	2	3	..
8. Mandya .. 6	..	96,250	1	2	..	3
9. Kadur .. 4	1	9,500	2	..	2	..
Total .. 121	6	10,98,694	17	53	30	21

While it is possible to ascertain the number of cattle attending a fair, it is rather difficult as at present to get the figures for the number of animals sold. It is generally believed that about 40 per cent. of the cattle in the fairs change hands and 10 per cent. of these are exported outside the State. Apart from the *jatras* considerable trade in young stock below the age of 3 years is taking place by regular contractors who march drives of young stock to places such as Hyderabad, Dharwar, Bellary and districts of Madras adjoining Nanjangud and Chamarajanagar. This is an undesirable feature of the cattle trade in Mysore. The rearers are tempted by good prices and dispose of the young calves mainly under economic stress at an early age when the potentialities of these as desirable or potential bulls is not clearly visible.

The agricultural class derives a direct advantage from the fairs. The buyers have the advantage of selection. And the institutions holding the fairs obtain a considerable sum of money by levying certain fees per head of cattle.

Table II indicates the collections made by the institutions.

TABLE II

District	Municipality	Muzrai	District Board	Private or Village Panchayat
	Rs.	Rs.	Rs.	Rs.
1. Kolar ..	..	21,265	4,276	292
2. Tumkur ..	..	5,942	500	2,500
3. Bangalore ..	491	13,035	2,006	..
4. Mysore ..	..	17,840	..	..
5. Hassan ..	212	1,910	1,300	..
6. Chitaldrug ..	..	700	890	..
7. Shimoga ..	..	1,100	2,615	..
8. Mandya ..	1,000	4,565	..	1,700
9. Kadur ..	..	..	..	..
Total ..	5,120	66,347	11,587	4,492
Total ..	87,546			

Muzrai Institutions, District Boards and Municipalities are authorised in G. O. No. 1779/4, B. 65–33–3 dated 7th September 1933, to levy an entrance fee on all cattle coming to the fair enclosure upto a limit of 8 annas per head and also special fee for competition. In the case of Muzrai fairs 60 per cent. of the collection goes to the temple. Of the 121 *jatras* held during 1940–41, 72 fairs have levied entrance fees; 43 were free and 6 were not held. In some cases the amounts collected are not known. Out of the 10,98,000 head of cattle attending these shows only 9,80,000 have paid an entrance fee at varying rates. In some fairs where the attendance of cattle has been more than 3,000 head, they have been exempt from the levy. The gross total income collected is Rs. 87,546 as shown in Table II, but if levy had been insisted at all the fairs collecting over 3,000 head of cattle the income would have been nearly a lakh of rupees. Further the maximum of 8 annas has not been levied in any of the fairs and there has been considerable variation in the fees levied as indicated in Tables III and IV.

TABLE III

Rates of Entrance Fee charged per Animal

District	Kolar			Tumkur		Bangalore			Mysore			Hassan		Chitaldrug	Shimoga		Mandya		Kadur
	6 p.	1 a.	2 a.	1 a.	2 a.	1 a.	2 a.	4 a.	1 a.	2 a.	4 a.	1 a.	2 a.	1 a.	1 a.	2 a.	1 a.	2 a.	Nil
Below 1,000 Cattle	..	..	..	..	..	..	1	..	1	..	..	1	2	..	..	..	..	..	..
Above 2,000	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
3,000	..	1	..	..	..	2	..	..	..	..	..	..	..	..	1	..	..	..	..
4,000	..	1	..	..	1	3	..	..	..	..	..	..	..	..	..	..	..	..	..
5,000	..	3	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..
6,000	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7,000	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8,000	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9,000	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..
10,000	..	2	..	..	..	1	..	..	..	..	..	1	..	1	..	..	..	..	..
12,000	..	1	..	..	1	..	..	..	..	..	..	..	1	1	1	..	1	..	..
14,000	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16,000	..	1	..	..	1	2	1	..	..	..	..	..	1	..	..	1	1	..	..
18,000	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..
20,000	..	2	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
25,000	1	1	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
30,000	..	..	1	..	..	..	..	..	..	2	..	..	..	..	1	..	..	..	..
35,000	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..
40,000	..	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
45,000	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
50,000	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Total	2	15	3	1	9	11	5	1	1	2	1	4	5	3	3	1	2	3	..
Not held or Free		10			13		5			7			3	5		1		1	4
Grand Total		30			23		22			11			12	8		5		6	4

It would be advantageous to charge the entrance fees on a sound basis, in order that improvements may be provided for and it is also suggested that

the collections may be departmentalised and not auctioned away for a lump-sum as at present; for that would help an accurate statistics of animals coming to the fairs being obtained.

The local institutions who hold the fairs make suitable arrangements for watering, stalling of cattle, etc. The Veterinary Department looks after the arrangements for stalling, sanitation and health of cattle. Before the fair comes to a close, certain prizes, mostly in the shape of ready made articles, are awarded to the best bulls and bullocks.

Certain improvements may now be mentioned to re-organise the cattle fairs into a show standard. The fairs as at present have very little of the "Show" element. A new orientation has to be given to make them demonstrative enough to help cattle improvement. Besides good bulls and bullocks, milking cows and buffaloes also should be brought to the shows and milking competition introduced. Certain rules, regulations and standards have to be brought in so that classes and groups of animals may be judged as in a show. Sheep and goats may be encouraged to be brought into the fairs. Prizes offered have to be made more attractive than at present as an inducement to the owners of animals. By effecting the required reorientation there seem to be great chances through the cattle fairs of building up the cattle wealth of Mysore.

Improvement of cattle wealth in Mysore has to be looked for in several directions. Cattle Farms may be started to build up good draught or milk cattle by scientific breeding, feeding and management. And local non-descript animals may be graded up and good breeding bulls may be distributed on a subsidised basis. But these efforts on the part of the Government are not enough. The willing co-operation of all the recognised breeders themselves is quite essential so that in any breeding policy and programme their valuable suggestion from practical experience would be of immense help to the officers concerned.

For this purpose it is suggested that a Central Cattle Improvement Board or Committee has to be set up with Taluk Committees from which elected members go to the Central Committee. The cattle fairs throughout the State have to be re-organised and the fee now levied has to be doubled and the extra income thus secured may be earmarked for a fund called the Mysore Cattle Improvement Fund. This measure is in consonance with the present trend of levy of cess on special crops or industries for their full exploitation and development. The State, of course, has to contribute an amount equal to the fund collected which may be utilised by the Central Committee for specific purposes. These may be for organising an All-State Cattle Show annually, at Mysore, comprising of all prize winners in the district and taluk shows; grant of attractive awards, purchase of suitable bulls for free distribution; grant of subvention for maintenance, for maintaining of an executive staff in the districts exclusively for cattle improvement; notably for collection of statistics, milk recording, *gomal* improvement, registering and opening

of herd books, conducting meetings and publishing a journal exclusively devoted to the livestock in Mysore.

Occasionally *jatras* are not held due to prevalence of contageous diseases in which case the local institutions, under whose auspices such *jatras* are held, are deprived of certain funds. Therefore, a reserve may be built up from the funds collected and the local institutions subsidised to some extent the loss of revenue.

Inseparable from the question of cattle improvement is the question of fodder resources. It is said that "all meat is grass"; and increased efforts have to be made to induce the raiyats to grow nutritious grasses in wet lands, to make ensilage, and to grow good grasses in *gomals* and manage them well.

If an organisation is set up as suggested and with the backing of ample resources, it seems to the writer, as certainly the best way to tackle the Livestock Improvement of the State.

[*Note.*—The foregoing is the summary of a Note prepared by the writer in 1942, on cattle fairs and cattle improvement in Mysore. The tables were prepared from the *Jatra* Reports sent by the District Veterinary Inspectors to the Superintendent, Civil Veterinary Services in Mysore.]

TABLE IV

Cattle Fairs held in Mysore State during 1940–41

Sl. No.	Place and Name of Cattle Fair	Whether conducted by the Muzrai, Municipal Council, District Board or Private	Number of Cattle Collected	Rate of Entrance Fee Levied	Total Income to the Institution holding Fair. Fees and Ground Rent
	KOLAR DISTRICT				Rs.
1	Vokkaleri ..	Muzrai	10,000	0 1 0	930
2	Vanarasi ..	District Board	10,000	0 1 0	1,221
3	Sri Gangamma, Srinivasa Sandra	Private	8,000	..	..
4	Sri Venugopalaswami, Kammasandra	,,	8,550	..	..
5	Sri Venkataramanaswami, Guttahalli	Muzrai	..	..	(Not held)
6	Sri Kothandaramaswami Jatra	,,	3,000	..	..
7	Thoranahalli ..	,,	40,000	0 2 0	
8	Vuyerahalli ..	District Board	3,500	0 1 0	
9	Doddinaikandoddi ..	,,	12 000	0 1 0	6,583
10	Kudianur ..	,,	25,000	0 1 0	
11	Chikkathirupathi ..	Muzrai	5,000	0 1 0	
12	Avani ..	,,	20,000	0 2 0	5,000
13	Mustur Channakalahalli ..	,,	5,000	0 1 0	500
14	Mulbagal Town ..	,,	5,000	0 1 0	400
15	Byrakur ..	,,	7,000	0 1 0	500
16	Kooliguriki ..	,,	15,000	0 2 0 (Per pair)	..
17	Yeldur ..	,,	..	..	(Not held)
18	Ronur ..	,,	..	..	,,
19	Kumbiganahalli Anjaneyaswami	District Board	14,000	0 0 6	125
20	Thalakailabetta ..	Muzrai	50,000	0 1 0	1,500
21	Melur Gangamma Jatra ..	District Board	24,000	0 0 6	400
22	Nallarakapalli Rama Jogeeswaraswami Jatra	Muzrai	200	Free	
23	Anemadagu (New) ..	District Board	60	,,	
24	Devaragudipalli ..	Muzrai	30,000	0 2 0	3,377
25	Mittemari ..	Village Panchayat	2,600	0 1 0	292
26	Singeralpalli ..	Muzrai	6,500	0 1 0	1,146
27	Yellodu Adinarayanaswami	,,	..	..	(Not held)
28	Viduraswatha ..	,,	20,000	0 1 0	2,000
29	Nandi ..	,,	20,000	0 1 0	900
30	Chitravati ..	District Board	10,000	..	..
	TUMKUR DISTRICT				
31	1 Siddaganga ..	Private	20,700	0 2 0	2,500
32	2 Biligere ..	,,	200	Free	
33	3 Hatra ..	,,	100	,,	
34	4 Pattanaikanahalli ..	Private Muttt	15,000	0 2 0	
35	5 Tavarekere ..	Muzrai	6,000	0 2 0	
36	6 Seebi ..	Private Muttt	8,000	0 2 0	
37	7 Kyamenhalli Anjaneyaswami ..	Muzrai	13,000	0 2 0	Auction for Rs. 3,000
38	8 Mathighatta ..	Private	500	Free	
39	9 Dasudi Sri Anjaneyaswami	,,	2,520	,,	
40	10 Karehalli Sri Ranganathaswami	,,	500	,,	
41	11 Chickanayakanahalli Town	Municipal Council	..	..	
42	12 Yediyur	Muzrai	12,000	0 2 0	1,255 (Not held)

TABLE IV—(*Contd.*)

Sl. No.	Place and Name of Cattle Fair	Whether conducted by the Muzrai, Municipal Council, District Board or Private	Number of Cattle Collected	Rate of Entrance Fee Levied	Total Income to the Institution holding Fair. Fees and Ground Rent
					Rs.
43	13 Gubbi Channabasavesvaraswami	Muzrai and Municipality Combined	6,000	0 1 0	390
44	14 Sangasandra ..	District Board	100	Free	
45	15 Hosakere ..	Muzrai	3,000		
46	16 Danaikanakere Kaval ..	,,	3,000		
47	17 Pura ..	Private	600		
48	18 Anakere ..	Muzrai	1,500	"	
49	19 Turuvekere Town ..	,,	3,500		
50	20 Dandineswara ..	,,	6,900		
51	21 Madhugiri Town ..	District Board	4,000	0 2 0	500
52	22 Nagalmadike ..	Muzrai	6,000	0 2 0	1,537
53	23 Hariharapura ..	,,	9,000	0 2 0	1,015
	BANGALORE DISTRICT				
54	1 Honnagara ..	District Board	16,000	0 1 0	856
55	2 Kittiganahalli ..	,,	1,200	0 1 0	..
56	3 Huskur ..	,,	4,000	0 1 0	470
57	4 Mayasandra ..	,,	1,500	0 1 0	140
58	5 Kankanhalli Town ..	Municipal Council	4,300	0 2 0	491
59	6 Shivanhalli ..	Muzrai	6,000	Free	..
60	7 Harehalli ..	District Board	2,800	0 1 0	140
61	8 Kodihalli ..	,,	600	Free	..
62	9 Kabbal ..	Muzrai	15,000	0 1 0	735
63	10 Upparahalli ..	District Board	30,000	0 2 0	1,500
64	11 Kegal Hanumantharayanagudi	,,	350	0 2 0	
65	12 Sugganahalli ..	Muzrai	22,000	0 2 0	1,500
66	13 Thirumalai ..	Municipality	15,000	0 2 0	1,500
67	14 Ghati Sri Subrahmanyaswami	Muzrai	40,000	0 4 0	11,000
68	15 Sivaganga ..	,,	25,070	0 1 0	
69	16 Mahimapura ..	,,	2,929	0 1 0	
70	17 Ramenahalli ..	Private	7,050	Free	
71	18 Byrasettihalli ..	Muzrai	3,122	0 1 0	
72	19 Honnadevi ..	,,	8,080	0 1 0	
73	20 Mahadevapura ..	District Board	1,000	Free	
74	21 Varthur ..	,,	2,000	,,	
75	22 Vasanthapura ..	,,	4,000	0 1 0	250
	MYSORE DISTRICT				
76	1 Nanjangud Town ..	Municipal Council	300	Free	
77	2 Mattekere ..	Public	250	,,	
78	3 Mudakatore ..	Muzrai	25,000	0 2 0	6,640
79	4 Bannur ..	Municipal Council	1,000	Free	
80	5 T. Narsipur ..	,,	2,000	,,	
81	6 Saligrama Town ..	,,	400	0 1 0	62
82	7 Chunchanakatte ..	Muzrai	50 000	0 4 0	9,000
83	8 Hale Yadatore ..	Municipal Council	4,000	Free	150
84	9 Halebidu ..	Private	3,000	,,	
85	10 Periyapatna Town ..	,,	1,800	,,	
86	11 Bettadapura ..	Muzrai	25,000	0 2 0	2,200
	HASSAN DISTRICT				
87	1 Konanur ..	Muzrai	500	0 2 0	75
88	2 Ramanathapura ..	District Board	13,000	0 2 0	800
89	3 Arkalgud ..	Municipal Council	600	Free	

TABLE IV—(*Contd.*)

Sl. No.	Place and Name of Cattle Fair	Whether conducted by the Muzrai, Municipal Council, District Board or Private	Number of Cattle Collected	Rate of Entrance Fee Levied	Total Income to the Institution holding Fair. Fees and Ground Rent
					Rs.
90	4 Keralapura ..	Muzrai	350	0 2 0	150
91	5 Bukanbetta ..	,,	9,000	0 1 0	600
92	6 Channarayapatna ..	Municipal Council	4,000	Free	
93	7 Sravanabelagola ..	Private Rent	3,000	,,	
94	8 Sakleshpura ..	Municipal Council	850	0 1 0	17
95	9 Holenarsipura ..	Muzrai	12,000	0 2 0	835
96	10 Malekal Thirupathi ..	,,	4,500	0 1 0	250
97	11 Gorur ..	District Board	10,000	0 1 0	500
98	12 Hassan Town ..	Municipal Council	30,000	0 2 0	3,400
	CHITALDRUG DISTRICT				
99	1 Thippeswami Jatra ..	Municipal Council	1,000	Free	
100	2 Challakere Town ..	,,	200	,,	
101	3 Nandagudi ..	District Board	10,000	0 1 0	500
102	4 Harihar ..	Muzrai	16,500	0 1 0	700
103	5 Harthikote ..	Private	8,000	0 1 0	390
104	6 Madarahalli ..	District Board	4,000	Free	
105	7 Kalledevarapura ..	Muzrai	4,000	,,	
106	8 Hosakere Dharpur ..	,,	220	,,	
	SHIMOGA DISTRICT				
107	1 Kudli Jatra ..	District Board	17,500	0 2 0	2,200
108	2 Thogarsi Village ..	,,	2,000	Free	415
109	3 Sulekere Jatra ..	Muzrai	12,000	0 1 0	500
110	4 Ramapura Jatra ..	District Board	25,000	0 1 0	
111	5 Bankasura Cattle Fair ..	Muzrai	5,000	0 1 0	600
	MANDYA DISTRICT				
112	1 Maddurammana Jatra ..	Municipal Council	8,000	0 2 0	1,000
113	2 Cotebetta ..	Muzrai	12,000	0 1 0	715
114	3 Adichunchanagiri ..	Private Mutt	14,000	0 1 0	
115	4 Hemagiri Jatra ..	Muzrai	42,000	0 2 0 (Adult)	3,500
				0 1 0 (Calf)	350
116	5 Baby Betta ..	Private	20,000	0 2 0	1,700
117	6 North Bank ..	,,	250	Free	
	KADUR DISTRICT				
118	1 Chikmagalur Town ..	Municipal Council	3,500	,,	
119	2 Antharagatta Jatra ..	District Board	..	..	Not held
120	3 Tarikere Town ..	Municipality	4,000	,,	
121	4 Somapura ..	District Board	2,000	,,	

The Sweet Potato

By Dr. L. S. Dorasami, M.Sc. (Lond.), Ph.D. (Lond.)
Economic Botanist, Department of Agriculture, Bangalore
AND
Mr. R. S. Iyengar, B.Ag.
Mysore Agricultural School, Hebbal

In the tropics, four root crops share honours for the place occupied by potato in the diet of the people of temperate climes. These are, Sweet potato, Tapioca, Yams and Colocasias. Of these, the Sweet potato (*Ipomœa batatas* L. Lam.) is a trailing herb of the morning glory group *Convolvulaceæ*.

The home of this root crop is believed to be Mexico. Obviously it found its way to the Orient very early, being heard of in China as early as the second century A.D. The term *batata* is of Malayan origin. The crop is found throughout the tropics and also in warm temperate regions. Though found all over India, worthwhile acreage is to be met with only in Bombay, Central Provinces United Provinces, Punjab and Hyderabad. In Mysore, the crop is considered to be a vegetable and is raised only to a very limited extent. While figures of the actual area under it are not available, a rough estimate would be as follows:—

District	Area in acres	Chief Taluks
Bangalore ..	350	Bangalore, Devanahalli
Kolar ..	400	Kolar, Malur, Bowringpet
Tumkur ..	250	Tumkur, Sira
Mysore ..	150	Nanjangud
Mandya ..	100	
Hassan ..	1,000	Hassan, Belur
Shimoga ..	150	Sagar, Sorab
Kadur ..	250	Chikmagalur, Koppa, Narasimharajapur
Chitaldrug ..	50	
Total area for the State ..	2,700	

In area and production, the taluks of Hassan and Belur are of foremost importance.

Though drought-resistant, Sweet potato is usually grown under irrigation on garden lands. The area under it in any holding in a season is usually small, rarely exceeding quarter of an acre. In parts of Hassan and Belur it is often found on dry lands as a rain-fed crop. Sometimes a summer crop is raised on river beds like melons. Such patches of Sweet potato are found on the beds of Tunga, Hemavathi and Kapila. While not fastidious as to the nature of the soil, the crop does best on deep friable loams. Adequate drainage is essential since Sweet potato does not withstand water-logging.

On light sandy soils the vines make poor growth and returns are low. Such soils require large quantities of manure and frequent irrigations to become productive. While harvest is speedy and easy, a large amount of unshapely long stringy roots are obtained. Heavy soils yield a larger crop with a smaller amount of manure and less frequent irrigations. While root shape and size are of desirable quality, the harvest will require a greater amount of time and labour. On very stiff soils, the roots will be of small size. On rich soils, the crop usually makes rank top growth at the expense of parts below ground. It is usually a first crop of newly formed gardens or of gardens allowed to lie fallow. Weed infested plots are purposely planted with Sweet potatoes, since the vines choke out the weeds and the harvest clears the land.

The crop requires a long warm growing season. Heavy rains are to be avoided, since excess of moisture is always harmful to the crop. When the vines are young and not properly rooted, heavy rains induce decay of vines and result in poor stands. In the presence of excess moisture, the growing crop runs to rank top growth. On wet soils, the maturing crop is liable to severe root infections.

Planting is usually done in May or June, the crop coming to harvest in November. In regions of heavy rainfall the vines are planted during the months of October and November, the roots being lifted in March or April next. Round about Bangalore, considerable off-season plantings take place to meet the demands of the vegetable market.

Thorough preparation of the land is necessary to obtain satisfactory yields. The plots are brought to a fine tilth by the repeated use of plough and harrow, but more often by manual labour. As a rule, manure is applied to light sandy loams. On better grade soils, manure is usually not used, or if at all, in sparing quantities. The general belief is that a direct application of manure to the crop results in rank top growth with consequent diminution of yields. The common practice is to liberally manure the preceding crop and allow the succeeding sweet potato to fend for itself. The plot is then laid out into beds 12′ × 6′ or 10′ × 10′ which dimensions are considered to be convenient for purposes of irrigation. Slips or vines are planted on to these beds, a common spacing being a foot and a half between rows and one foot in the row. Frequently the vines are set in shallow depressions made in such level beds. Sometimes the beds are thrown up into ridges a foot and a half apart and vines set halfway down the slopes. While ridge culture involves a little extra labour and more copious irrigations, the trouble and expense is offset by the ease of harvest. The method of planting has no appreciable influence either on the quality of the produce or on its quantity.

Propagation is by slips or vines. A slip is a small shoot with a few roots at the lower end. These are obtained from bedded roots, each root throwing out several slips. Two crops of slips may be gathered from each bed. About 10 maunds of roots is bedded to provide slips sufficient to plan

an acre. The shape and size of the bedded roots has not much influence on yield. Large roots require a heavier rate of bedding, while small ones throw out weak slips, hence both is to be avoided. Slips are ready in about five weeks after bedding and should be about six inches in length.

Planting of vines is more economical and is the usual method in vogue. Now and then vines from a standing crop are used directly for planting. This is an undesirable procedure since the chances of carrying over the weevil are ever present. Vines are usually obtained from special nurseries, started with cuttings from the crop of a previous season. Sometimes overaged slips furnish material for planting. The tender tips and the hard lower end of shoots are not used for planting. Cuttings should be made from that part of the vine which, when pressed gently between the fingers, is not crushed but remains pliable. The vines are set slantwise with a couple of nodes below ground level and bearing the same number on the top free end. Sometimes the vines are planted in a loop with a portion above the surface.

The slips or vines are set into moist beds on a cloudy day. Till the vines root freely, water if at all applied is given sparingly. Subsequent irrigations are given freely as the necessity is felt. The frequency of irrigations and the amount of water applied is governed by the nature of the soil, amount of rainfall, humidity, and the age of the crop. The young crop is weeded once and the trailing vines turned over periodically without causing appreciable injury. If left undisturbed the vines root freely at the nodes producing a large quantity of small-sized unmarketable roots. As the roots begin to thicken the tips of vines are usually pinched off. This is believed to increase the size and yield of roots and hasten maturity. These tender tips may be used as greens.

The crop lacks any pronounced visible signs which indicate maturity. Bronzing of leaves is often an indication and another is the so-called latex test. The Sweet potato is said to be ripe when it exudes very little latex when cut across and this hardens off very rapidly. Premature harvest often takes place to meet the demands of the early market and for consumption on the homestead. An immature crop results in lower yield, greater amount of bruising while harvesting and subsequent handling, lowering of flavour and cooking quality, poor keeping quality, hence greater loss before the produce is disposed off. Imigations cease when the crop is judged to be ripe. A mature crop can be left standing without any risk of deterioration, if the state of weather is favourable. This, not only results in an increased yield, but also spreads out the period of harvesting giving the grower an opportunity to search for favourable markets and reduces his storage problems.

The vines are usually cut before the roots are dug up. The green tops find a ready use as fodder. After harvest, the roots are cleaned, graded and disposed off in the nearest market. Yields are very variable, a good crop resulting in over 400 maunds of marketable roots. Half of the above

would be a fair average yield. Calcutated cost of production for an acre would be:—

	Pair	Men	Women	Boys	Rs.	As.
Preparatory cultivation and laying out beds ..	..	33	4	..	19	14
Manure and manuring ..	1	3	2	..	8	2
Nursery of vines ..	..	..		..	7	0
Planting ..	..	..	16	..	4	0
Weeding, turning over and pruning of vines ..	..	..	23	..	5	12
Irrigations (12) ..	..	..	..	..	12	0
Harvesting ..	1	6	20	6	10	9
Land rent and watch ..	..	..	..	..	10	0
Marketing charges ..	..	..	..	..	5	0
Total ..					82	5 or 83

Realization (200 mds. at As. 10 per md.) .. Rs. 125
Approximate profit per acre .. „ 42

Since the crop is drought-resistant and very hardy, it is troubled by a few pests and diseases. The one pest which often causes loss is the weevil. Excess of moisture favours the development of several rot organisms in the standing crop as well as in the stored produce. Field rats and whiteants usually cause considerable damage.

Two types of Sweet potato—the red and the white—are under cultivation. Commercial stocks are considerably mixed up but work on isolation of superior clones is under way. The red type consists of races with roots of varying shades of scarlet and pink with sweet taste. The flesh is not fibrous and these types are preferred for culinary purposes. While the cropping capacity is poor the keeping quality is considered to be superior. The white type produces creamy, buff or pale-brown roots. The flesh is not so sweet; hence, less palatable. The roots are slightly larger in size and more crisp in texture. While less vigorous than the red types, the cropping capacity is greater but the roots are supposed to undergo much loss when held in storage.

A considerable portion of the produce is consumed near the centres of production, the remainder finding its way to the urban markets. While no export trade exists, a small quantity is usually imported from neighbouring provinces for supplying the markets of large towns. Trade is inconsiderable and mostly local.

Considerable possibilities exist for the expansion of Sweet potato production in the State. A foremost necessity is to raise the average yield which can be easily trebled or even quadrupled. This is to be effected by replacing the present commercial stocks by suitable heavy croppers, which could be obtained by breeding and by introductions from outside. Devising of suitable manures and fertilizer mixtures to raise the present low yield is also of very great importance. As regards expansion of acreage, much headway can be made in the *Kar* tracts of Mysore and Hassan for the dry

crop. The Irwin Canal area offers unbounded possibilities for the irrigated crop.

The resulting increase in out-turn naturally calls for the devising of suitable methods of curing and storage. Marketing facilities have to be created and additional markets looked for. The lowering of production costs also ought to be aimed at to enable the sweet potato to compete favourably with other food products and raw materials needed by industry. It may also prove expedient to set up new industries like dehydrating concerns, starch factories as the starch in this is considered to be better than Tapioca and alcohol plants.

In conclusion, our thanks are due to Mr. K. Gopala Iyengar for his kind help and suggestions.

SELECTION

The Eleventh Commandment or Care of the Land

Dr. Walter C. Lowdermilk thinks we should have an Eleventh Commandment. He argues that the Ten Commandments have been guides to men for more than 3,000 years ; they tell people their duty to God and to their fellow-men. His argument is that we need also to be told our duty to the land on which we and our children depend for food. This is how he feels the Commandment should go.

'Thou shalt inherit the holy earth as a faithful steward, conserving its resources and productivity from generation to generation. Thou shalt safeguard thy fields from soil erosion, thy living waters from drying up, thy herds, that thy descendants may have abundance for ever. If any shall fail in this stewardship of the land thy fruitful fields shall become sterile stony ground and wasting gullies, and thy descendants shall decrease and live in poverty or perish from off the face of the earth.'

As a matter of fact, Doctor Lowdermilk wrote an article which was first published in the *American Forests*, the magazine of the American Forestry Association, Washington, D.C., U.S.A. The article has been abridged and published in a little pamphlet called The Eleventh Commandment or Care of *the Land*. It makes most refreshing reading. What is Doctor Lowdermilk's qualification for writing this pamphlet? The Foreword tells us : he spent 15 months studying how man has treated the land through the ages in Egypt, Algeria, Tunisia, Libya, Trans-Jordan, Palestine, Lebanon, Syria, Iraq, Italy, France, Holland, Scotland and England. He has also been through Northern China.

Throughout the article it is shown how people have come to grief because good fertile lands have been turned into deserts through soil erosion due to wrong methods of cultivation and neglect. He tells of the waste of land in the Middle East and Palestine.

" To travel through desert places where land was once good is sad. People have moved away and there are ruins of great cities.

In North Africa, large presses for getting the oil from olives are to be seen where not a single olive tree is growing to-day. There are also ruins of stone presses for getting the juice from grapes, but there are no vineyards in which grapes grow. In these places men misused the land and made a desert where before there were fine farms and gardens.

To-day the tribes who live there have thistles and thorn bushes as an inheritance and are ready to fight for every water-hole and blade of grass which appears after the rains. They set up their tents on the ruins of fine cities. There hunger, strife and destruction where once there was life.

The death of good land means the death of the people who lived on it. Ruined land is a more sorrowful thing than ruined cities."—*The Journal of the Jamaica Agricultural Society*, Oct., Nov. and Dec. 1944.

Regional Committees in Kadur District

Meetings of members of the Agricultural and Experimental Union were called during the fortnight commencing from 15–3–1945, in different taluks of the Kadur District. Six Taluk Committees and the District Committee were formed.

Chickmagalur

The meeting at Chikmagalur was held at the Town Hall at 6 p.m., on 16th March 1945. Mr. S. N. Ramanna, B.A., LL.B., Advocate, Chikmagalur, presided.

The Assistant Director of Agriculture, Chikmagalur, Mr. Abdur Rubb, welcomed the members to the meeting.

The Secretary of the Union outlined the activities of the Union giving an idea of Field-Days, meetings for discussion, conduct of experiments on members' farms and the publishing of the Journals of the Union. The increase in the strength of the Union was brought to the notice of the members and it was explained that by formation of Regional Committees agricultural problems of different localities could be discussed more effectively and ways and means found for further improvement of agriculture.

The Taluk Committee was then formed. Mr. D. C. Rudrappa, Coffee Planter, was chosen President of the Committee and Mr. Honnappiah and the local Agricultural Inspector were chosen as Secretaries.

A District Committee also was formed suggesting names for approval of other Taluk Committees for different taluks. Mr. A. C. Mallegowda, M.L.C., was elected President of this Committee with Mr. S. N. Ramanna as Vice-President and Mr. Annappasetty of Chikmagalur and the Assistant Director of Agriculture were chosen as Secretaries.

The Chairman then delivered his speech. He said that the agriculturists had to organise on a large scale and they could get things done which would be individually rather difficult. In his opinion, agricultural improvements had to be advertised on a much larger scale. The cinema, he said, could be particularly used. It may perhaps be made a condition of licensing that the exhibitor should agree to throw on the screen short lengths of picture depicting agricultural improvements to be supplied to them. These would appeal to all the visitors to the movies. After forming the Taluk Committee he said that every quarter the officers of the different sections of the Agricultural Department should be invited to read papers and aquaint the local members with the latest work done under the particular sections. Once a year at the time of the District and Taluk Conferences a three-hour programme should be arranged for all members and their friends to hear about these improvements, exchange views and enlighten themselves. The Chairman quoted the instance of advanced countries and said that in building such services as the Tractor Service, etc., the Regional Committees could put their minds together.

The Agricultural Inspector, Mr. C. B. Krishnamurthy, proposed a vote of thanks.

Mudigere

The meeting at Mudigere was held at the Travellers' Bungalow at 6 p.m. on 17th March 1943, Mr. M. Hutchegowda, M.L.C., presiding.

The Secretary of the Union explained the objects of the Regional Committees and answered the querries raised by a few of the audience. The utility of testing seeds, manures and other Departmental recommendations on the raiyats' holdings was stressed and it was brought out that the suggestions of the Committee would be helpful in building up local agricultural service.

The Agricultural Inspector, Mr. M. Shankaraiah, also spoke about improved agriculture and requested the members to induce more of their friends to join the Union.

The Taluk Committee was formed with Mr. M. Hutchegowda as the President. Mr. Kaduvally Seetharamiah and the local Agricultural Inspector were chosen Secretaries. Two members were chosen to the District Committee.

The President in his speech said that such a Committee ought to have been formed long back and there was an opportunity for the agriculturists of the locality to work out their good through it.

The meeting terminated with a vote of thanks proposed by the local Agricultural Inspector.

SRINGERI

The meeting at Sringeri was held on the top floor of the Sharada Bank at 6 p.m., on 20th March 1945. Mr. Kuthugodu Nagabhushan Bhatta presided.

The President commencing said that there were many agricultural problems they had to discuss together and the idea of the local Agricultural Committee was therefore welcome.

The Secretary of the Union traced the growth of the Union and said that the malnad had contributed much material for scientific study in the nature of its crops like arecanut, pepper, cardamom, coffee, oranges and paddy. Good agriculture would stand out against the background of nature and there was scope to concentrate on good points that would help improving their agriculture and compare notes with one another.

The Agricultural Inspector, Koppa, suggested that the members gathered should give their experiences.

Mr. Atmarama Bhide, Mr. Ramabhatta, Mr. Sreenivasa Setty and others took part in the discussions, which mainly centred round the seed rate for paddy. The general concensus of opinion was that a much smaller seed rate than usually in vogue was sufficient—about 15 to 20 seers—though the same principle could not be applied to plots at higher and lower levels.

Consensus of opinion being obtained that for such and many other discussions and work in other directions for the improvement of local agriculture the organisation of the Committee would be useful, the Committee was formed. Mr. Kaulkudige Subba Rao was elected President and Mr. Shivashankara Sastry, Bhaskara, Secretary along with the local Agricultural Inspector.

It was decided that seven should form the quorum for the Committee meetings and the Committee should meet once a month.

Nomination to the District Committee was approved.

The President, in his closing remarks, pointed out that much land in malnad lay waste for want of labour, and there was a marked decrease in Sringeri from last year to this. In old days, malnad was populated by a system of colonisation and even now the improvements should be tackled with a grip to be effective.

And then the meeting terminated with a vote of thanks.

KOPPA

The meeting at Koppa was held at the Town Hall at 6 p.m., on 21-3-1945. Lokasevaniratha M. S. Dyavegowda presided.

The Agricultural Inspector, Koppa Range, explained the object of the day's meeting.

The Secretary of the Union gave a brief history of the Union pointing out how agricultural improvements were discussed by the members. It was indicated that the subjects discussed were of a wide range including improved ploughs, strains of ragi and paddy, livestock of Mysore, economic plants, farm accounts and colonisation.

A discussion on different topics ensued. Dr. Krishnaswamy of the I.C.A.R. Rubber Scheme spoke on the usefulnesss of farmers' associations. He said that in the production of good strains of seeds the Government and the raiyats should co-operate. Local problems should be kept in mind in working towards better

ment and when certain results are given by research stations the farmers should test their correctness on their holdings.

Mr. Subba Rao described how remedial measures against *Koleroga* had developed among the garden owners and different adhesives were now being tested. Here was a concrete example of co-operative testing.

Mr. B. S. Madhava Rao said that ' Kotte tying ' was still in vogue in North Canara and it was worth considering if arecanut produced under ' Kotte ' was not of a better quality than that obtained from sprayed plants. The Agricultural Inspector, Koppa Range, said the variety of arecanut called ' Rama Adike ' seemed to be resistant to disease and perhaps it would be useful if garden owners kept an eye on plants that did not succumb to disease and gave information about them.

It was brought out from the discussions that the more immediate problem was that of gardens left unsprayed amidst a great number that were sprayed, acting as sources of infection constantly.

After discussions, the Taluk Committee was formed with Lokasevaniratha M. S. Dyavegowda as President and Mr. B. S. Madhava Rao as Secretary along with the local Agricultural Inspector. Nominations to the District Committee were approved.

The President delivered his speech (published in the Kannada Journal, April 1944 issue).

The meeting terminated with a vote of thanks.

Narasimharajapur

The meeting at Narasimharajapur was held in the Travellers' Bungalow, at 6 p.m., on 22–3–45. Mr. N. P. Govinda Gowda, B.A., District Board President, presided.

The Secretary of the Union gave the details about the Union. The Union was started in 1918 by Dr. L. C. Coleman to bring practical agriculturists and the Officers of the Department together. Many subjects have been discussed and given shape on its platform. Manuring of crops, improved ploughs, causiurina cultivation, costs of cultivation, and colonisation could be mentioned among these. The central idea of the Union is that individual farmers should carry on tests on their farms. There are Government Experimental Farms here and there, and around them have been organised year by year subvention farms on raiyats' holdings to prove further the results of experimental farms. Local field-days could easily be conducted on such farms. The Local Committees by organising these help a great deal in bringing home the improvements to all the raiyats in the locality. Then there is the publication of results. In this line the Union is now running two journals, one in English and one in Kannada. For these, the Union has its Central Office. There are now 1,400 members of the Union all over the State. The purpose of the Union, it was considered, would be further served by formation of Taluk, District and Hobli Committees.

Discussions followed. Mr. Kudli Venkatarao said that Narasimharajpur was known for its jaggery. The tract was known as ' *Dana Vasada Seeme* '. Committees of agriculturists, he said, should help to keep up the best in local agriculture. Mr. Subrahmanya Bhatta, Subvention Farm Owner, said that two varieties of paddy he tried, S. 661 and S. 749, were good. Some strains did not prove good. There were malnad and semi-malnad areas for each of which different strains were required. Hence the necessity of trials and exchange of views. Mr. Eregowda said that in malnad manure problem was a serious one, and this should be discussed and supplies effected. Spare parts of implements came up for argument and the members were all of opinion that iron ploughs are being adopted but their use is limited due to want of spare parts. Eureka plough points and standards were chiefly required for the locality.

A few members were of opinion that seeds and manures should be given for 4 acres or more in a place for demonstration. Others were of opinion that things yet unproved so far as the local farms were concerned should be tested on a small

scale, in the first instance. A few members said that labour difficulty was acute. In general, it was agreed that a Committee as suggested should be formed and requirements listed by it sent to the Agricultural Department so that facilities may be arranged.

The Taluk Committee was formed with Mr. N. P. Govinda Gowda as President and Mr. H. Dattadri, Coffee Planter and Landlord, as Secretary, along with the local Agricultural Inspector.

Nominations to the District Committee were approved.

The President then spoke as follows: He considered the meeting as unique as it was specially called to discuss agricultural improvements. Each agriculturist had given his experience and meetings should continue in a similar way. He laid stress on Subvention and Demonstration Plots. This was an effective device to make the raiyat conduct his own experiments. A good demonstration plot would catch the neighbours' eyes. The difficulty arose when the farmer did not understand the principle of the Subvention or Demonstration Plot. The seeds that are taken for test should be multiplied, preserved and tested till something definite could be said of them. The Local Committee should meet and discuss results obtained on these test plots. Then only the farmers can know all about a new seed or manure and suggest programmes of demonstration. One of the difficulties of the farmers now was to get labour in time. Seedlings which had to be transplanted in 20 days took 50 days in an instance because of this trouble. It was rather a difficult problem. But it was not beyond them to find some means according to time and place if they met in Committees and discussed. One good farmer conducting a test could influence 10 neighbours in the first instance. These 10 can carry improvements to 50 in the first year and 250 in the next. So should the circle of farmers carry on tests and adoption of improvements should grow. The speaker gave the example of '*Bilikan-hegge*' paddy of which he planted 45 days' seedlings but which gave him 7½ pallas ; it could have been denounced if they had not waited patiently till the harvest was actually reaped. There was no speciality in the cultivation but there was good water facility. Long range experiments were required in many cases. Dabbanasale was for example a good paddy. It should not be given up. Coimbatore paddy was no good if there was no water but it could be adopted if water was in plenty. To exchange all these experiences, to put difficulties before the authorities, to take action themselves where possible. for all this the Committee would be of great help. He exhorted his friends to become all members of the Union, to read the journals, and improve their agriculture.

The meeting terminated with a vote of thanks.

KADUR

The meeting at Kadur was held in the Town Hall at 6-30 p.m., on 25-3-45, Mr. K. M. Satyanarayana Setty, Vice-President, Kadur Municipality, presided.

The Secretary, Agricultural and Experimental Union spoke about its objects and informed the audience about the Taluk Committees already formed.

The Kadur Taluk Committee was formed with Mr. K. M. Satyanarayana Setty as President, and Mr. D. R. Vijayadeva as Secretary, along with the local Agricultural Inspector.

Nominations to the District Committee were approved.

The meeting terminated with the President's speech and vote of thanks.

26-4-45. M. V.

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